

## ***Interactive comment on “Individual and combined effects of ice sheets and precession on MIS-13 climate” by Q. Z. Yin et al.***

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Received and published: 5 May 2009

General comment This paper is the follow up of two previous papers related to MIS 13 also published in *Climate of the Past* by the same first author (Yin & Guo 200, Yin et al. . In the present manuscript Yin et al investigate the effect of ice sheets, focusing more specifically on the impact of their size, and precession on the global climate of this particular interglacial with expectation on further developments. This is a well-written manuscript particularly interesting to read because of the global dynamics accurately completing the previous papers mainly related on the East Asian monsoon. Doing so it gives the study a broad interest and replaces the observed variations in the East Asian summer monsoon on a global perspective, especially the association of EASM with a wave train linked to European ice sheets. As it will be discussed later

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it also provides some clues, or at least some directions to follow to understanding or interpreting the climate mechanisms responsible for other observed variations. When discussing results for a particular area, providing references of published observations would give a strong added value to the paper and its interpretations. This paper is definitively appropriate to be published in *Climate of the Past* provided some comment or minor improvements. On a formal point of view, the cited references should all be listed in the reference list, which is not the case. The figures are too small and should occupy the whole page to be more easily readable. The abstract should be much more informative with regards to the different points addressed in the paper.

More detailed points to discuss. Introduction. Although the title does not directly mention the monsoon system, the paper address precipitation variations and wind dynamics related to the monsoon dynamics and so should have developed the references concerning this general system, especially the interconnection the different sub-branches. Furthermore Kukla and Kukla addressed the orbital signature of interglacials in their 1974 *Science* paper that you should mention and discuss in the introduction

Page 560 line 9. The reference “Mélières et al” is not in the reference list. Furthermore, I would recommend citing papers by Rossignol-Strick as for example the *Nature* 1983

Page 560 line 10. Instead “which reflected increasing discharge” I would suggest using “which was interpreted as increasing discharge” because of the controversy about the origin of the sapropels.

Page 561 lines 2-4. Could you discuss the decline of the snow cover with the increase summer monsoon?

Page 561 line 20. In climate model of intermediate complexity as LOVECLIM, the representation of the atmospheric dynamics is simpler than in more sophisticated models. As your paper is addressing such important mechanism, could you comment a little bit more about the nevertheless appropriateness of its use?

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Page 562 line 4: with CO<sub>2</sub> equal to 240 ppmv. When referring to the EPICA results in the paper by Lutti et al, 240 ppmv do not correspond to both 506 and 495 ka BP. Can you comment the choice of 240?

Page 564 line 23 you mention the maximum anomaly of about 70 Wm<sup>2</sup> centered 30°N at the summer solstice. This latitude is particularly important especially for the East Asian summer monsoon. Any further comment?

Page 565 lines 26-27. You mention, "On the contrary, the large NH continents with their land cover (vegetation and snow) make NH more sensitive to changes. Although you address the vegetation cover as an output of the model, as well as the snow cover, you should refer to a paper by Goes et al 2005 in Science about the importance of the snow cover on the NH climate dynamics and more especially on the monsoon dynamics itself.

Page 568 lines 17-19. "Over the high latitudes...ice sheets". While this is an output from the model, you should also refer to observed variations of the snowfield and its relations with climate change as noticed and presented by Kukla et al

Page 573 line 24 – Page 574 line 10. You discuss the precipitation pattern over China related to the East Asian monsoon. In that present case you should refer to the recent publications about i) the general present monsoon system showing interconnections between the different sub systems, ii) more specifically the East Asian Monsoon system itself. (see Trenberth et al 2006, Webster 2006).

Page 574 lines 22-23. You outline the importance of the ice sheets, whatever their sizes, as reinforcing July precipitation over East China when NH summer is at perihelion. In your experiment, the size of the ice sheets varies between no ice sheets and the LGM size. Furthermore the estimated elevations of the ice sheets rely on their extent. However, this is not necessarily the case and furthermore one may know that at least in Europe, the extent of the Fennoscandian ice sheets has been more important in older times than during LGM. Thus could you provide some comment about the

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impact of greater ice sheets than the range used in the experiment?

Page 576 lines 21-23 you indicate that when ice sheets are large, the cooling effect is stronger than topography effect, preventing the formation of the wave train and reducing the precipitation over East China. As you refer later to extreme summer monsoon events observed during colder intervals could you rephrase this sentence to prevent any further misunderstanding and misinterpretation of your results.

References: The two references Overpeck et al and Paterson listed page 581 are not cited in the text. While Mélières et al is cited but not in the list. Furthermore the reference list shows inaccurate abbreviations such as Q. Sci. Rev. for Quat. Sci. Rev. In the paper by Rousseau et al 2008, add "T" in front of "here" but change the reference. Indeed this paper as well as the one by Guo et al 2008 are referred to Climate of the Past discussion and so are not the definitively published papers. Please update the references by using the Climate of the Past reference as available in the CP library.

Figures As mentioned earlier, the figures as available on the CPD version are too small, too big lateral margins and should occupy the whole width of the published paper. Make it so please. Figures 4, 7, 9, 10 require a general title to be more explicit. In all the figures you are using letters a, b, c... to differentiate the different panels but these letters do not appear on the figures

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Interactive comment on Clim. Past Discuss., 5, 557, 2009.

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